12. The method in accordance with claim 9 wherein the catalyst is in a concentration of from about 30 to 500 ppm of the weight of cumene hydroperoxide decomposition product.

13. The method in accordance with claim 9 wherein the temperature of the cumene hydroperoxide decomposition is about 50° to 90°C.

14. The method in accordance with claim 9 wherein the quantity of cumene hydroperoxide remaining after decomposition is from about 0.2 to 3.0 wt % of the total weight of the decomposition products.

15. A composition comprising cumene hydroperoxide, cumene, acidic catalyst for decomposition of cumene, dicumyl peroxide, dimethylbenzyl alcohol, phenol, and acetone wherein the acetone is present in excess by an amount of 10 to 100 percent acetone relative to the amount of acetone produced during the reaction.

E 1 cont

16. An improved method for enhancing the decomposition of cumene hydroperoxide and producing cumene hydroperoxide decomposition products therefrom wherein the improvement comprises recycling the cumene hydroperoxide decomposition products in a cumene hydroperoxide back-mixed decomposition reactor in sufficient quantity whereby selectivity is higher and safety of the process is improved.

17. The method in accordance with claim 16 wherein additional acetone is added to the cumene hydroperoxide decomposition products in an amount of from about 10 to about 100 percent of the amount of acetone produced during cumene hydroperoxide decomposition reaction.

18. The method in accordance with claim 17 wherein additional water is added to the cumene hydroperoxide decomposition products to a level not greater than 4 wt. % in the cumene hydroperoxide decomposition mass.

19. An improved method for enhancing the decomposition of cumene hydroperoxide to phenol and acetone wherein the improvement comprises introducing additional water into the cumene hydroperoxide decomposition reactor.

20. A cumene hydroperoxide decomposition mass produced from the reaction of cumene hydroperoxide with an acid catalyst in a non-isothermal manner having acetone present in excess by an amount of 10 to 100 percent acetone relative to the amount of acetone produced during the reaction.

21. A method for the efficient generation of recycle acetone in a process which prepares phenol and acetone from cumene comprising

(a) decomposing dicumylperoxide to phenol, acetone, and alpha methyl styrene

(b) feeding at least a portion of decomposition products of (a) to a separate vessel wherein operating temperature is higher or operating pressure is lower than step (a), thereby allowing acetone to evaporate,

(c) sending at least a portion of acetone collected from step (b) to the cumene hydroperoxide decomposition reaction.

E 1 cont

22. A process for decomposing a cumene oxidation product mixture containing cumene hydroperoxide (CHP) and dimethylphenyl carbinol (DMPC) to produce phenol, acetone and alpha-methyl styrene (AMS) with enhanced safety of operation and reduced by-product formation which comprises the steps:

(a) mixing the cumene oxidation product in a stirred or back-mixed reactor with an acid catalyst, with 10 to 100 percent acetone relative to the amount of acetone produced during the decomposition reaction, and with up to 4 weight percent additional amounts of water relative to the reaction mixture, at an average temperature between about 50°C and about 90°C for a time sufficient to lower the average CHP concentration of the reactor to between about 0.2 and about 3.0 weight percent, and wherein a portion of DMPC is converted to dicumyl peroxide (DCP); then

(b) reacting the reaction mixture from step (a) at a temperature between about 120°C and 150°C under plug-flow conditions for a time sufficient to decompose substantially all residual CHP and at least 90 percent of the DCP formed in step (a).

23. The process of claim 22 wherein step (a) additionally comprises reacting the reaction mixture having an average CHP concentration of between about 0.2 and about 3.0 weight percent at between 50°C and about 90°C under plug-flow conditions for a time sufficient to produce a reaction mixture having a CHP concentration no greater than about 0.4 weight percent.